THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

Publishing Office, No. 42 Pine Street.

Devoted to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science.

VOLUME XVIII.—No. 4.
WHOLE No. 315.

NEW YORK, MONDAY, FEBRUARY 17, 1873.

$3 PER ANNUM
IN ADVANCE.

Dayton's Gas Naphthalizer.

On the editorial page will be found some account of very interesting experiments with this apparatus, of which we here present a cut, and a description from the inventor. Mr. Dayton, in describing this machine, refers first to a previously patented apparatus for naphthalizing or "carburetting" air.

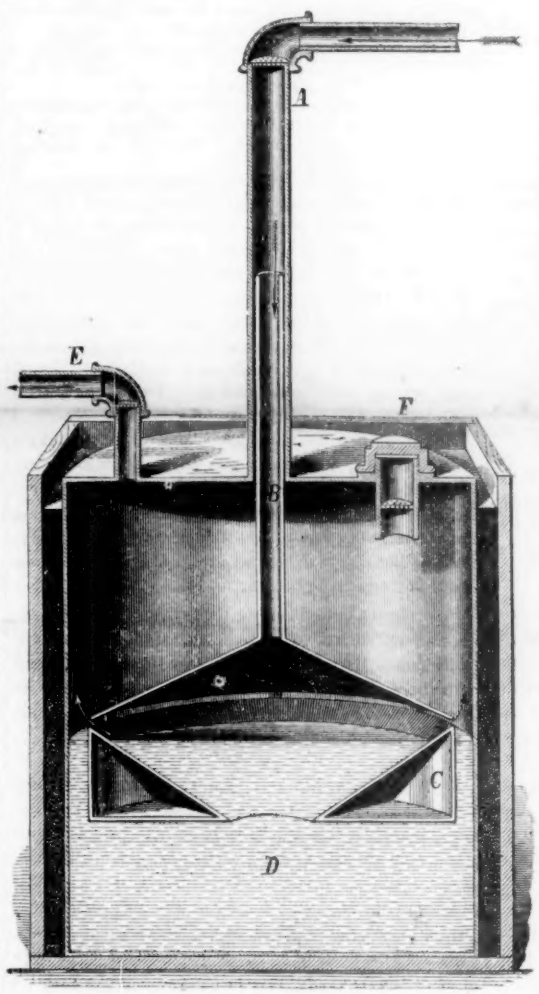
In that apparatus a vessel is placed upon the bottom to contain warm water to afford the requisite heat to the superincumbent mass of gasoline, or other hydrocarbon, contained in the main body of the apparatus; and the air which is fed to the machine, in order that it may be carburetted, is first warmed (in cold weather) by being passed through a heater, and thence conducted into the interior by a pipe which terminates in a circular disk convexed upward. The office of this disk or plate is to spread the induced current of air out evenly over the surface of the gasoline, and thus promote the process of carburetting it, and the feed-pipe before mentioned was passed down through the top of the vessel and made an air-tight joint therewith, and was rendered adjustable by a screw packing-box, to the end that the plate might be raised or lowered so as to be kept always just above the surface of the gasoline.

He then goes on to describe the present arrangement as follows:

I now make the gas-feeding pipe fast into the top of the vessel containing the hydrocarbon, and provide the spreading-disk with a pipe of its own of such diameter that it will slip up and down within the supply-pipe, as the disk may rise and sink with the surface of the gasoline in the vessel; and further, provide a hollow tube bent to conform to the outer edge of the plate or disk, and so attached thereto as to leave an annular space between them large enough to allow the carburetted gas to escape freely out through it when the tube itself is partially or wholly submerged in the hydrocarbon. Thus this bent tube operates simply as a float to hold the spreader always just above the surface of the hydrocarbon automatically. It may be made solid as well as hollow, and of any suitable material.

In the drawing, fig. 1 represents a perspective view of the machine shown and described in my other before-mentioned patent, with the addition of the new improvements above described. In this figute the front half of the wall of the machine is represented as having been removed in order to display the interior parts. Fig. 2 represents a central vertical section of the body of the machine and of a portion of the supply-pipe E for the admission of the gas, and of the plate or disk C with its own pipe P, and the bent tube or float K.

The improvements are so fully shown in the drawing, that it is not necessary to describe them further.



I have not mentioned them in connection with any other machine than the one shown and described in my said other patent, but it is obvious that they may be used with advantage in other like machines differing in many respects from the one I have herein shown and described.

What I claim as my invention in this particular patent is—

In combination with the feed pipe E, the plate C having the pipe P and the float K, constructed substantially as and for the purpose described.

HENRY G. DAYTON,
Maysville, Kentucky.

This patent was issued to Mr. Dayton October 8th, 1872, No. 131,943.

A World Puzzle.

The following, hoping some reader may comment on it for us, we have given the above title:

"If we had not the consoling conviction that none of the four exploring expeditions now seeking the north pole, will ever succeed in getting beyond the hither shore of that open polar sea whereof all navigators dream, we should feel disposed to implore the gods in mercy to impede their hyperborean progress. And this not because we are less curious than our neighbors concerning the precise nature of the axis whereon our earth rotates, but because all the lessons of our school days assure us that there must be some circle of arctic latitude from which, once passed, to return is impossible. Every boy, when first told how rapidly the world spins around, has probably asked what keeps the inhabitants from flying off at a tangent, and has been informed in reply that the attraction af gravitation (which he, of course, recollects was suggested to Sir Isaac Newton by the fall of an apple) suffices to more than counterbalance the centrifugal force occasioned by the rotatory motion of our planet. But obviously this centrifugal impetus diminishes as we approach the centre of rotation, and the gravity which gives a man firm foothold at the equator, where he is whirled around at the end of a radius 4,000 miles long, would at the quiescent pole make him so heavy that no effort of human muscle could raise his heel from the ground; for be it remembered that if he stood erect upon the earth's summit the only motion impressed upon him would be that of turning slowly round once in twenty-four hours. It may, perhaps, be possible to explain away the difficulty which we have suggested, just as it ought to be possible to account for the day lost in circumnavigating the globe; but until our scientists shall afford an explanation consonant with their own former teachings, it is our solemn duty to warn all heedless polar explorators of the dire risk they run.—*N. Y. World.*

EXPERIMENTS have lately been made in Russia with naphtha as fuel for locomotives, which we learn have proved entirely successful. Proviecki, the Russian engineer conducting the experiments, reports that a steamboat using this fuel ran some 180 kilometers. The engine worked regularly although the weather was exceedingly stormy. The quantity of naphtha necessary is about 25 per cent. less than the ordinary amount of coal used, and the engineers estimate that by careful use some 50 per cent. less may be carried.—*Manufacturer and Builder.*

Chemical Repertory.

No. 86.—February 17, 1873.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

632. Wonderful Facts and Figures.—The question of Sir Humphry Davy, on the first introduction of gas, whether they would "take the dome of Saint Pauls for a gas-holder" has been much ridiculed. Davy was only somewhat far-seeing: that is all. In view of the recent strike in London, Dr. Carpenter urged that the gas companies ought to keep a stock of gas on hand. Whereupon Dr. Whitmore replied publicly that it would be impossible to provide any adequate storeage, for the Imperial sent out from eight million to ten million cubic feet of gas every night, and on Christmas Eve about twelve million. He stated on a subsequent occasion that he had since received a letter from the secretary to the gas company, stating that the quantity sent out last Christmas Eve was twenty million cubic feet, and next Christmas Eve it was expected that twenty-two million cubic feet would have to be sent out. To provide storeage for a fortnight's consumption would require fifty gas-holders as big as St. Paul's!

636. Artesian Wells in Chicago.—The number of these wells is multiplying rapidly. Twenty-one of them have already been bored, and in no instance has a failure to obtain a plentiful supply of water occurred. The well at Kenwood, just south of Chicago, 1255 feet deep, and 5½ inch diameter at the bottom, yields 650 gallons per minute; it cost about $6000. Another well, in the business center of Chicago, is 1600 feet deep, yields 525 gallons per minute, and cost $7000. The usual depth of the wells is from 1200 to 1300 feet, and the average cost is $6000 for a 5½ inch well 1200 feet deep, and $5000 for a 4¼ inch bore to the same depth. The surface pressure of the water varies from 22 to 35 lbs. to the square inch, and the latter pressure is sufficient to throw a stream to the height of 100 feet. The deepest well in Chicago is in the South Park, where the bore, 3½ inch in diameter, has been carried down 1640 feet. The comparative smallness of the flow from this well is adduced as an argument in favor of larger borings.—*Iron Age.*

634. Prediction Verified.—A curious illustration of the power of scientific prediction, even in subjects by no means of a mathematical kind, has just been afforded us. In the "Mineral Statistics of the United Kingdom of Great Britain and Ireland for the year 1871," just published by Robert Hunt, Keeper of Mining Records, the consumption of coal in 1871 is stated at 117,352,028 tons. In Prof. Stanley Jevons' book on "The Coal Question," published more than seven years ago, he estimates the probable consumption of coal in Great Britain for 1871 at 117,900,000 tons.—*London Mining Journal.*

635. Stagnant Water and Typhoid Fever.—Out of one hundred and forty families supplied with milk from a dairy in Islington, England, seventy suffered from Typhoid fever. One hundred and sixty-eight individual cases occurred within ten weeks, and thirty died. An investigation showed that the cows drank water from an old underground tank, built of wood, and much decayed. The milk cans were washed in the same water, and in all probability the water was also mixed with the milk. As the fever attacked only such parties in that district as used the milk, the water in the rotten tank must have been the cause. This is only one more evidence of the danger of using foul water, and giving it to animals. It has been shown that stagnant water acts as a slow poison to animals as well as men, and it is a matter of the first importance to all dairymen and stock raisers, as well as families, to use pure fresh water.—*Amer. Artisan.*

636. Economic Use of Coal for Domestic Purposes.—The council of the Society of Arts have issued the following announcement: "With reference to the sum of £500 placed at the disposal of the council, through Sir William Bodkin, by a gentleman who does not wish his name to appear, for promoting, by means of prizes or otherwise, economy in the use of coal for domestic purposes, the council have decided to offer the following prizes:

"1. For a new and improved system of grate suitable to existing chimneys as generally constructed, which shall, with the least amount of coal, answer best for warming and ventilating the room—the Society's Gold Medal and £50.

"2. For a new and improved system of grate, suitable to existing chimneys as generally constructed, which shall, with the least amount of coal, best answer for cooking food, combined with warming and ventilating the room—the Society's Gold Medal and £50.

"3. For the best new and improved system of apparatus which shall, by means of gas, most efficiently and economically warm and ventilate a room—the Society's Gold Medal and £50.

"4. For the best new and improved system of apparatus which shall, by means of gas, be best adapted for cooking, combined with warming and ventilating the room—the Society's Gold Medal and £50.

"5. For any new and improved aystem of arrangement not included in the foregoing, which shall efficiently and economically meet domestic requirements—the Society's Gold Medal and £50.

"The council reserve to themselves the right of withholding all or any of the above prizes, as the judges appointed by them may determine.

"The competing articles must be delivered not later than the 1st of December, 1873, with a view to their being tested, and subsequently shown in the London International Exhibition of 1874.

"Further particulars as to place of delivery and other arrangements will be published as soon as they are finally settled."

637. Blue Sky and Water.—*Les Mondes* quotes from M. Collas the following remarkable views: He first refers to the blue color exhibited by the pure water of certain lakes, and says that it is due to the therein dissolved or very minutely divided gelatinous silica, quoting as instances the lake of Geneva, the water of the d'Huis, and more particularly the water of a source near to the Mont-Dore (Department du Puy-de-Dome), which water is even blueish-colored when placed in a white glass decanter. The blue color of the sky is referred by the author to the same cause, viz., very finely divided gelatinous silica (hydrated silica) kept in suspension in the clouds on account of its great lightness.

[We cannot help deeming these hypothesis as having a plentiful lack of probability. Still no more curious chemical questions exist that those connected with the distribution of silica in soils, waters, etc. As to silica in the asr, except as mere dust, that seems really beyond credibility.—H. W.]

638. Gas for Moving Street Cars.—We learn from the *Scientific Press* that Mr. H. Frank of Pittsburg, is making an experiment in the propulsion of street cars by an invention which consists in the use of two cylinders, of different capacities, as 1 to 8, the smaller cylinder to be filled with gas at a pressure of 300 lbs., the other with air at the same pressure, the pressure first to be utilized as power and then supplied in the right proportions for combustion under a vertical tubular boiler, where it is ignited by a small burning jet of gas. It is so arranged that no fuel is used except when the car is in motion, when of course neither steam nor smoke will be generated. The inventor claims that the fuel or gas, for a nine horse-power engine, can be supplied at a cost of only eight cents per hour.

639. Wet Fuels.—Our *confrere*, the *Engineering and Mining Journal*, arguing that no theoretical or practical gain, whether of heat or of temperature, is involved in the combustion of fuel containing water, says: We assume, for the sake of argument, that the water of the fuel is decomposed by the carbon, and that the hydrogen thus liberated is oxydized again to water-vapor. We have showed that, assuming these reactions to be complete, they affect only so much water as the carbon can decompose, namely, about three parts of water to two of carbon, which is nearly the amount contained in the best air-dried wood. For so-called *wet* fuels, therefore, such as green wood, or wet tan, or air-dried peat, the reactions referred to have no significance, since they do not affect the excess of water. It remains now to be mentioned, that even under favorable conditions—namely, large excess of carbon and of oxygen, and consequent high temperature—the re-combustion of hydrogen is not complete. Mr. Lowthian Bell has pretty clearly shown (*Chemical Phenomena of Iron Smelting*, page 118), that hydrogen may exist to the extent of from 5 to 10 per cent. of the volume of carbonic oxide in the escaping gases of an iron blast-furnace, when coke or charcoal is the fuel. As he says (page 414), whether the decomposition of water is a source of real loss of heat depends on the condition of the hydrogen when it escapes. If it is not oxidized, but free, the economy of the combustion is less than if the water had merely been vaporized and expelled, without decomposition.

640. Fuchsine Without Arsenic.—Dr. Dingler.—It appears that at the extensive aniline pigment factory of Messrs. Meister, Lucius, and Bruning of Hochat-on-the-Main, the aniline oil is converted into rosaniline by the aid of nitro-benzole. This process, which yields excellent results, may be elucidated in the following formulæ:

Toluidine. Rosaniline.

$$2(C^{14}H^7HHN) + C^{12}H^5NO^4 = C^{14}H^7, C^{14}H^7, C^{14}H^7N^3 + 4HO$$

641. To Make him Flea Away.—Mr. Ely said at a late meeting of the New York Farmers' Club that there are two or three substances that are obnoxious to the flea—he does not like the smell of them, or they remind him of something he does not like to think about—these are carbolic acid and sulphur. If you want a barn thoroughly purged of weevils, or lice, or fleas, the best way is to fumigate it with sulphur. But if you whitewash all around the stables and posts of the yard with a whitewash made by adding carbolic acid to the lime, it will drive most of these pests away. Washing an animal thus infected with carbolic soapsuds will give relief.

642. New Hydrocarbon Isomeric with Anthracene.—E. Schmidt.—After first briefly referring to Grabee's new body (see Excerpt No. 595), the author describes, at length, his discovery, in crude mononitroanthracene, of a new hydracarbon belonging to the $C_{14}H_{10}$ series, which differs from anthracene as well as from the body described by Grabee. This new hydrocarbon is a solid crystaline body, fusing at 247° (anthracene at 213°; Grabee's hydrocarbon at 205°); it is insoluble in cold, but somewbat soluble in boiling alcohol, and readily soluble in benzole, sulphide of carbon, and chloroform. This hydrocarbon combines with picric acid, is not acted upon by nitric acid of sp. gr. 1·2, but readily so by the strongest nitric acid; with sulphuric acid, this substance forms a sulpho-acid.—*Berlin Chem. Society.*

643. Another New Hydrocarbon from Coal Tar.—Ostermayer and Fittig.—The authors record at length, and elucidate by a series of formulæ, their researches, the result of which is the discovery of another hydrocarbon in coal-tar, or, rather, in one of the heavier oils—boiling above 300°—obtained from tar. The new body is also a solid substance, fusing at from 97° to 99°; boiling point, above 300°; it combines with picric acid, and forms, by oxidation, a chinone differing from anthrachinone and yielding, by oxidation, diphenic acid.—*Ibid.*

644. Miners Recklessness.—A correspondent of the *London Mining Journal* says that he visited the Pentre Colliery, Ystrad, Rhondda Valley, South Wales, on the morning of April 13, 1871; at the time they were fully engaged in clearing up the wreck caused by the terrible explosion of February 24, 1871. My business gave me free access to the lamp cabin, and to

the pit bank. Lamps seemed to be exclusively used, and each one cleaned and replenished his own to his taste, while officials noted approval and formally locked them on the pit bank. I counted sixteen men ready to descend the shaft; nine out of the number were unconcernedly smoking their pipes, and of the eight that entered the cage four were smoking pipes as they descended the pit, and others put them in their pockets. Locked lamps in their hands, and blazing pipes in their mouths! I turned from the pit, and asked myself, What of rules, what of lamps? What of inspectors, and who are managers?

6d5. Underground Temperatures.—We have already stated the fact that Father Secchi has undertaken to conduct a series of experiments on underground temperatures at the Mont Cenis tunnel. We now see it stated that instruments similar to those to be used by Father Secchi will be furnished to the Smithsonian Institute, for similar observations in the great tunnel which is now being cut through the Hoosac Mountains in Massachusetts, as well as to observers at Ballarat, Moscow, St. Petersburgh, and Paris, at which localities explorations are being made in the Sub-Wealden rock. Observations of much value are expected from these distant localities.—*Sci. Press.*

646. Spontaneous Combustion of Coal.—A newspaper writer, who is evidently not familier with the commonness of the phenomenon, speaks nevertheless to the point in referring to a case of spontaneous combustion occurred not long since in a pile of bituminous coal discharged from the cars at Nashville. It appears that the coal had not been moved since it was deposited in June, and that the fire originated in the centre of the heap, several feet from the surface. "Is a new peril by fire upon us? And how about the coal rooms of the steamers; are they iron-plated to resist the spontaneous combustion of their contents?"

647. The Water Telescope.—For seeing under water; consists of a tube to enable a person looking over the gunwale of a boat to rest the head on one end, while the other is below the surface of the water; the upper end being so formed that the head may rest on it, both eyes seeing freely into the tube. Into the lower end is fixed—water tight—a plate of glass, which, when used, is to be kept under the surface of the water so that the spectator, looking down the tube, sees all objects at the bottom whose reflective powers are able to send off rays of sufficient intensity to be impressed on the retina, after suffering the loss of light caused by the absorbing power of the water. Light in passing through pure sea water, loses half its intensity for each fifteen feet through which it passes, says Sir John Leslie. In clear water the bottom may thus be seen at the depth of twelve fathoms. This contrivance is much used in seal shooting along the northern and western islands in Great Britain, where, sometimes in the form of an ordinary washing-tub with a piece of glass fixed in its bottom, the shot seal is looked for, and the grappling-hook let down to bring him to the surface. The Norwegian fisherman also often use this telescope when their anchors get into foul ground, or their cables warped on a roadstead.—*Exchange.*

Waste of Fuel in Imperfect Combustion.

A writer in the Providence *Press* says: There are few people who will not admit that it is an evil to see a third or a half of their outlay for food or for fuel needlessly going for naught. If a householder discovered that one half of all the flour which he bought and sent home was wasted by the cook, he would soon discharge that culinary creature. If his stove burnt up half the meats and vegetables, that instrument would speedily be sold for old iron.

But householders are content to see half their fuel go up the chimney in the shape of noxious gas and smoke, instead of having it burned into genial and healthful heat. Under our ordinary system of burning either wood or coal, bituminous and anthracite, about 50 per cent. of true combustible fuel is thrown away. And worse than this, there is no need of any such extravagant waste.

Let a man know that every flake of soot, every cloud of smoke, every odor of pitch, or every choking, acrid taste of gas which he detects as going off from his fires, whether into chimney-flues or the rooms of his house, is simply fuel unburned, fuel of precisely the same kind as that which has burned in his fire-box, fuel just brought into a state ready for combustion, and he will have the means of roughly estimating the loss he suffers in warming his house.

The chemical problem here presented is a very simple one. It is merely this: the carbon and volatile gases escaping from wood or coal are the real fuel. There can be no fire until these gases are liberated from the fuel. Next, the process of burning is simply that of turning these gases into oxides, of mingling with them a certain proportion of oxygen taken from the air. Finally, this affinity between carbon and oxygen acts with a readiness proportioned to the temperature. The problem of perfect combustiyn, therefore, is to supply enough oxygen or air to satisfy the affinity of these volatile gases for it, and to do this at a sufficiently high temperature. The mechanical difficulty is that of detaining the unburned smoke and gas over the flame when a strong draft is passing through the fire, and to separate the particles of volatile matter sufficiently to bring them in contact with the air.

The readiest mode of accomplishing this result is that of a downward draft, instead of an upward one. As frst as the coal decomposes, for example, the gases tend to rise. A current of air moving upward carries these gases rapidly away from the flame, and into a temperature in which they will not oxidize. Now, if the supply of air which is to furnish the oxygen for combustion is introduced at the top of the fire, and is forced to find its way downward through the blazing mass in order to get an outlet, it is evident that the draft will take the volatile and unburned gases rising from the fuel back through the flame and fire, with a supply of oxygen to consume them. By this simple expedient a very large part of the smoke and gas which escapes from an ordinary stove into the chimney would be consumed. Indeed, this fact is quite well understood among students of heat, and the experiment has been often successfully tried. We have known of such drafts turned through a body of bituminous coal, the most volatile of all fuels, and the combustion was so perfect that the observer could not detect the slightest escape of smoke from the chimney.

Yet our stove makers go on making their drafts all upward and sending 50 per cent. of the purchaser's fuel up into the air, without any benefit to him, and to the rapid exhaustion of the world's limited supply. It is a serious matter to think of, the prodigal waste of fuel when the supply is the result of slow timber growths, or of long periods of geological action. Here is a destruction worse than that recklessness which led the pioneer to destroy whole forests, and burn them in heaps, that he might clear his land. The pioneer destroyed one form of wealth that he might produce another. The common stove wastes half of the fuel consumed in it, without substituting any benefit for it. There are mechanical difficulties to overcome in securing perfect combustion, but these are of comparatively trivial moment. They concern only the degree of efficiency to be obtained, not the working of the principle. The mechanic's problem is simply this: there is a very great gain in economy in any application of the downward draft, but how can the very best results be secured? We are not discussing the sanitary points connected with this question; the loading of the air with grimy soot and acrid gases. We have not referred to the secondary economies. such as the destruction of furniture and clothes, and the corrosion of furnaces and chimneys by the unburned gases. We wish chiefly to open the eyes of men to the single fact, that they are at present getting only about half the real benefits of the fuel which they burn; that, practically, with the usual stoves and furnaces employed, they pay for two tons of coal in order to get one burned. This is an obvious matter of economy, and it is marvellous that so little has yet been done to reap the enormous profit of doubling our supply of fuel.—*Iron Age.*

["What is everybody's business, is nobody's business," is one of the wise proverbs of the days of yore. Who is to investigate and indicate to consumers of fuel the apparatus and methods of economy? We say, what is everybody's business is the *Government's* business. Let Congressmen be elected, who instead of being mere hack politicians, and usually mere wolfish partisans and parasites, shall be men of scientific training, and let Congressional Committes be organized, not of men interested merely in the production (therefore also in the consumption) of fuel, but of conscientious scientists who will report to the public after a million spent faithfully in conscientious researches, on fuel.—H. W.]

Adamantine.

Professor Orton says: There is little doubt that diamonds exist in many places as yet unknown, or where their presence is unsuspected. It is very difficult for the unpracticed eye to distinguish them from crystals of quartz or topaz. The color constitutes the main difficulty in detecting their presence. They are of various shades of yellowish brown, green, blue and rose red, and thus closely resemble the common gravel by which they are surrounded. Often they are not unlike a lump of gum arabic, neither brilliant nor transparent. The finest, however, are colorless, and appear like rock crystals.

In Brazil, where great numbers of diamonds, chiefly of small size, have been discovered, the method of searching for them is to wash the sand of certain rivers in a manner precisely similar to that employed in the gold fields, namely, by prospecting pans. A shovelful of earth is thrown into the pan, which is then immersed in water, and gently moved about. As the washing goes on, the pebbles, dirt and sand are removed, and the pan then contains about a pint of thin mud. Great caution is now observed, and ultimately there remains only a small quantity of sand. The diamonds and particles of gold, if present, sink to the bottom, being heavier, and are selected and removed by the practiced fingers of the operator. But how shall the gems be detected by one who in a jeweler's shop could not separate them from quartz or French paste? The difficulty can only be overcome by testing such stones as may be suspected to be precious. Let these be tried by the very sure operation of attempting to cut with their sharp corners, glass, crystal, or quartz. When too minute to be held between the finger and thumb, the specimens may be pressed into the end of a stick of hard wood and run along the surface of window glass. A diamond will make its mark, and cause, too, a ready fracture in the line over which it has traveled. It will also easily scratch rock crystal, as no other crystal will.

But a more certain and peculiar characteristic of the diamond lies in the form of its crystals The ruby and topaz will scratch quartz, but no mineral which will scratch quartz has the *curved edges* of the diamond. In small crystals this peculiarity can be seen only by means of a magnifying glass: but it is invariably present. Interrupted, convex or rounded angles, are sure indications of genuineness. Quartz crystal is surrounded by six faces; the diamond by four. The diamond breaks with difficulty; and hence a test sometimes used is to place the specimen between two hard bodies, as a couple of coins, and force them together with the hands. Such a pressure will crush a particle of quartz, but the diamond will only indent the metal.

The value of the diamond is estimated by the carat, which is equal to about four grains, and the value increases rapidly with its weight. If a small, rough diamond weigh four grains, its value is about $10; if eight grains, $40; if sixteen grains, $640. A cut diamond of one carat is worth from $50 to $100.

The imperfections of the diamond, and, in fact, of all cut gems, are made visible by putting them into oil of cassia, when the slightest flaw will be seen,

A diamond weighing ten carats is "princely"; but not one in ten thousand weighs so much.

If a rough diamond resemble a drop of clear spring water, in the middle of which you perceive a strong light; or if it has a rough coat, so that you can hardly see through it, but white, and as if made rough by art, yet clear of flaws or veins; or if the coat be smooth and bright, with a tincture of green in it, it is a good stone. If it has a milky cast, or a yellowish green coat, beware of it. Rough diamonds with a greenish crust are the most limpid when cut.

Diamonds are found in loose pebbly earth, along with gold, a little way below the surface, towards the lower outlet of broad valleys, rather than upon the ridges of the adjoining hills.

Purifying Gas.

LETTERS PATENT TO ROBERT HOGARTH PATTERSON, OF HAMMERSMITH, IN THE COUNTY OF MIDDLESEX, GENTLEMAN, FOR THE INVENTION OF "IMPROVEMENTS IN THE PURIFICATION OF COAL GAS."

Sealed 28th May, 1872, *and dated 9th March*, 1872.

[Concluded from page 40.]

Sulphide of sodium washers or scrubbers.—Sulphur is mixed with caustic soda in a solution, and the proportions which I prefer—although others may be used—are one pound of sulphur and two and a half pounds of soda to each gallon of water. This mixture (which may be placed in a tank to which steam is conducted) is to be raised to or nearly to the boiling point, whereby the sulphur and soda will be dissolved, uniting in the solution. The liquor is then to be used in washers or scrubbers through which the gas is passed after having been purified from sulphuretted hydrogen and carbonic acid. The liquor is to be retained in the washers, or repassed through the scrubbers until it becomes so charged with sulphur as to be incapable of acting efficiently as an absorbent of the sulphur compounds remaining in the gas, whereupon it is to be withdrawn from those vessels and fresh liquor employed. The fouled liquor so withdrawn being highly charged with soda and sulphur, is an article of commercial value.

A similar solution of sulphur and soda may be made by procuring sulphide of sodium from chemical works. This material is to be used in a solution; the strength which I prefer—although the solution may be of other strength—being 3½ lbs. of the material, or thereabouts, to each gallon of water.

A similar solution may also be formed more conveniently in gas works by passing the gas containing sulphuretted hydrogen through a solution of soda until the sulphuretted hydrogen is no longer absorbed. This can be done by employing the soda washers or scrubbers in the manner already described for making or producing sulphide of calcium in lime purifiers, namely, by using these washers or scrubbers immediately before other vessels of the same kind, viz.—containing a solution of caustic soda—and passing the gas into the said vessels before it has been purified from sulphuretted hydrogen. Then owing to the power of carbonic acid—contained in the entering gas—to displace sulphuretted hydrogen from the soda solution, the sulphuretted hydrogen can be driven forward from the first soda washers or scrubbers of the series in any quantity (by changing the soda solution as soon as carbonic acid appears in the issuing gas), thereby converting the soda solution in the subsequent vessels into sulphides of sodium.

Note.—The best manner of employing the processes above described—other than those which relate to purification by lime—appears to me to be as follows:

After condensing, scrubbing, and eliminating sulphuretted hydrogen by oxide of iron purifiers, as at present practised, pass the gas through soda washers or scrubbers, thereby eliminating all the carbonic acid, and thereafter pass the gas into washers or scrubbers containing a solution of sulphide of sodium, produced in any of the above mentioned ways, to purify the gas from sulphur in other forms than sulphuretted hydrogen. Or, purifiers, whether containing lime or oxide of iron, may be entirely dispensed with and the purification of gas from carbonic acid and from sulphur in all forms be effected by means of the soda washers or scrubbers. In this case these vessels will be worked on the same principle as that devised and above described for the working of lime purifiers (vide § II.) the chief portion of the process for applying which principle may for the sake of ready intelligence be repeated here, reference being made to soda washers or scrubbers instead of to lime purifiers. Pass the gas through the first washers or scrubbers of the series for such time that the carbonic acid from its greater affinity for soda shall have expelled sulphuretted hydrogen from these first washers or scrubbers of the series, taking its place and driving it—namely, the sulphuretted hydrogen—forward into the succeeding vessels. By this means the carbonic acid can be wholly eliminated from the gas by the first washers or scrubbers of the series, while sulphuretted hydrogen being driven forward converts the contents of the succeeding vessels into sulphide of sodium, which is a highly efficient material for purifying the gas from sulphur in other forms than sulphuretted hydrogen. Thereupon these latter mentioned washers or scrubbers containing sulphide of sodium may be placed first in the series and the gas passed through them into subsequent vessels containing a caustic solution, whereby the contents of these subsequent vessels, or of any of them, can be converted in turn into sulphide of sodium. Or, the first vessels of the series may be constantly employed chiefly as decarbonators—i. e., for eliminating the carbonic acid from the gas—while the sulphur in all forms is eliminated from the gas in the succeeding washers or scrubbers.

I believe that such a process of purification will be found not only more convenient but also more economical than any process of purification by means of lime. Besides the great saving of labor effected by the use of washers or scrubbers instead of purifiers it is to be observed that lime once used in purifiers is thereafter useless, and the sulphur contained in it is likewise lost, whereas the soda solution used in my washers or scrubbers can be perpetually "revivified" in the gas works, while the sulphur in it can be disposed of as an article of commercial value. The "revivifying" of the soda solution, when it has become carbonated—as in the first or decarbonating vessels of the series—is effected simply by throwing caustic lime into the tank containing the fouled liquor, stirring it about until the solution becomes caustic, whereupon the lime being allowed to settle sinks to the bottom in the form of carbonate of lime, and the revivified liquor is drawn off to be used again in the washers or scrubbers. This process may be greatly accelerated by heating the liquor in the tank by steam, in which case also no stirring of the liquor is necessary. The sulphuretted portion of the fouled liquor (from the last or sulphide of sodium vessels of the series) may be disposed of as an article of commercial value to chemical works. But the more economical plan is to employ the following complete process of revivifying the fouled soda solution in the gas works, whereby the sulphur is simultaneously obtained in an odorless and commercial form:

Chalk—carbonate of lime—is burnt in a retort, and the carbonic acid evolved from it is conducted into the tank containing the fouled liquor from the whole series of soda washers or scrubbers, whereby the sulphur is expelled from the liquor by the carbonic acid, and is then passed into a vessel containing oxide of iron, where the sulphur is arrested and obtained in a commercial form. Thereafter the caustic lime remaining in the retort, or a little more than that quantity, is thrown into the liquor in the tank, whereby the said lime will decarbonate the liquor, converting it back into a solution of caustic soda ready to be used anew in the washers or scrubbers, while the lime is withdrawn from the tank in the form of carbonate of lime ready to be used over again in the retort. In this way no nuisance is occasioned by the use of those washers or scrubbers, so that this process can be used in any gas works, wherever situated, while the soda solution employed in them is revivified in the gas works and the sulphur which it has absorbed from the gas is simultaneously obtained in a commercial form.

Having now described and particularly ascertained the nature of my said invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider to be novel and original and therefore claim as the invention secured to me by the herein-before in part recited Letters Patent is—

Firstly. The employment of sulphides of calcium in separate purifiers as a means of purifying coal gas from sulphur existing in other forms than that of sulphuretted hydrogen.

Secondly. A method or system of employing lime purifiers in the manner herein-before described, whereby the contents of all of the said purifiers, or of any required number of them, can be converted into sulphides of calcium, and also, if required, be maintained in that condition.

Thirdly. The employment of a solution of caustic soda, or of potash, or of ammonia, used in washers or scrubbers in the manner herein-before described in order to eliminate carbonic acid from coal gas, and in such a manner as to convert the lime in purifiers, or the soda solution contained in any required number of the said washers or scrubbers into sulphides of calcium and sulphides of sodium respectively, and also, if required, to maintain them in that condition.

Fourthly. The employment of the soda washers or scrubbers after the gas has been purified from carbonic acid and sulphuretted hydrogen as a means of purifying the gas from sulphur existing in other forms than that of sulphuretted hydrogen.

Fifthly. The employment of sulphur in a fine state of division in conjunction with an inert substance suitable to form a porous material through which the gas may pass freely, or in combination with lime or with soda, or with lime and soda together, in solution or otherwise, in order to effect the purification of coal gas from sulphur existing therein in other forms than that of sulphuretted hydrogen.

In witness whereof, I, the said Robert Hogarth Patterson, have to this my Specification set my hand and seal, this Sixth day of September, One thousand eight hundred and seventy-two.

R. H. PATTERSON. (L. S.)

Machines for Drying Sewage.

In the chemical treatment of sewage, a great hitherto almost insuperable difficulty has been met with in drying the deposit obtained by their processes. The mud produced, differs in its character from every other kind. Its chemical and physical nature is unique, and hence while every mode of drying has been attempted, no existing plan meets all the necessities of the case. As a rule the deposit from sewage afforded by any of the chemical processes, contains, after draining to the largest extent, about nine parts of water to one of the subsequently dried manure. Practically, about ten tons of water must be evaporated to procure a ton of solid matter, which will even then contain from 14 to 18 per cent. of moisture. The solid so obtained is highly hygrometric, and consequently rapidly absorbs water from the atmosphere.

Recently, two patents have been taken out in England, in both of which mechanical arrangements are employed to facilitate the drying, and, at the same time, to pulverize the manure, one of which is on Milburn's, and the other on Gibbs and Borwick's plan. Both methods depend on the use of hot air or gases, such as the products of the combustion of coal, but the mode of using the hot gases essentially differs.

Milburn's machine has recently been put into operation at the Borough Sewage Works, Leicester, England. It consists of a bed or floor formed of iron plates, which are heated by a fire placed under the wet or feeding end. The fire is covered by a fire-brick arch, which terminates in a bridge in which are suitable openings to allow the flame to pass through, and thence beneath the iron drying floor. Covering the fire with the brick arch prevents any excess of heat playing upon the floor, and consequent damage to the mud. Over the floor is placed a frame—extending nearly to the length of the floor—to which is fixed a series of transverse bars, the edges of which rest on the floor, and act on scrapers. On the top of the frame are a number of vertical slits, about three on each side, in which crank pins work, the crank being attached to suitable gearing at each side of the machine, all being arranged so as to revolve together. The vertical slits are equal to the full length of the stroke of the crank, so that for each stroke the frame moves to and fro, and the transverse bars scrape the whole of the bed, and keep the mud from caking. On the top of each vertical slit a movable block is fitted, which is adjusted by a screw, and serves to shorten the slit. As the slits are contracted, lift is given to the frame at its backward motion, when the scrapers pass over a portion of the mud. At the return stroke

eoch scraper passes a portion to the next scraper, and thus the mud travels through the whole length of the plate, until it comes off at the end in a dry and pulverized state. Between the scrapers, and fixed to the movable frame, is another series of transverse bars which serve as pulverizers. They are fixed aboye the plate or floor, but do not touch it. For example, at or near the wet end they do not approach nearer to the plate than 1½ inch; each successive bar, however, comes down closer, until the last one, at the delivery or dry end, almost touches the plate. By these means the pulverization of the dried mud is effected. In addition to these pulverizers, which travel with the frame, others of a stationary kind are employed. Transverse bars are fitted to the side of the machine, carrying a series of prongs, which assist to break up the dried mud. In drying, the hot air from the fire, ofter passing under the floor, returns over it with the vapor, the latter being conveyed by a flue to the engine chimney.

Gibbs & Borwick's machine, at work at the Native Guano Works, Crossness, England, is constructed on identical principles with the above, the form and mechanical arrangements, however differing. In this case there is employed an iron cylinder, into which the mud is introduced. Here it is kept stirred up by revolving scrapers, and in the course of drying it is gradually pulverized. The heat is afforded by a furnace placed beneath the cylinder, and the hot air from it is conducted so as to pass twice over the drying mud. As in Milburn's machine, the feed of mud and exit of dried manure are at opposite ends.

The trials which have been made with these machines afford for the present no results from which accurate data can be given. At Leicester some mud that had long lain in the open air was mixed with water, and used for experiment; but as no note was taken of the proportion of water to solid, the estimates formed are destitute of any value. Precisely the same remarks apply to the present trials of Gibbs & Borwick's machine. The mud used had been previously made into a solid cake by being passed through a Needham press. A really trustworthy experiment with both machines has not been made—that is, an experiment from which the cost, time, etc., required to dry one ton of mud containing nine or ten parts of water to one of resulting solid can be accurately determined; and until this can be done, the value of each invention remains practically untested.—*Iron Age.*

Coal as an Element of National Strength.

(Concluded from page 41.)

With the appliances of modern chemistry we can so condense an ox that he can be carried in a hand basket, and so to-day we find a mighty tree of a past era, reduced to a scuttle of coals. We find the sunshine of the past concentrated in a tropical growth, and long stored up in the hidden places of the earth, now lighting all our houses, the heat driving our locomotives with the speed of the wind, and carrying our burdens with the strength of an army of giants. Think of a single locomotive performing in a day the work of ten thousand camels on the Arabian sands! Well may we be thankful for these vast granaries—so well filled by our Joseph, during the years of plenty, that when the famine kine devoured the forests that were on the earth, and the years of famine came, we had abundance in store for all the nations.

It is so well located, too, this power treasure of ours; placed near the great centre of commerce, with a Divine foresight that just here it would be most needed; river channels opening for it pathways to the sea; mountain walls cloven asunder to lay their black diamonds open to the miner's hand; and again, that the whole land might share in the blessing, vast deposits underlying the western plain, where no forests wave and man find no other fuel.

Nor must we think of this warmth and light giving coal as a creature comfort only. It preserves the life and energy of nations. Professor Tyndall says the destiny of the English nation "is not in the hands of its statesmen, but in those of its coal owners; and while the orators of St. Stephen's are unconscious of the fact, the life-blood of the nation is flowing away." The fearful amount mined from English soil gives that nation no little concern; so much, indeed, that one of its writers is constrained to offer no better consolation than this:

"Economy will reduce our consumption; the burning of waste heaps of coal will be stopped. America will relieve us from the world-wide demand for our coal, and will, eventually, furnish this country with as much as we want." Let us see, now, how the coming demand upon America's resources is to be met.

In our estimates of the areas of the anthracite coal fields of Pennsylvania, we place that of the

Southern coal field at	146	sq. miles.
Of the Shamokin district	50	"
Of the Mahanoy	41	"
Of the Upper Lehigh field	35	"
Of the Wyoming and Lackawanna field	198	"
Total	470	sq. miles.
	or, 300,800	acres.

Averaging the total coal thickness of the Southern coal field at 75 feet, and that of the Middle and Northern fields at 45 feet, we have a total content (one cubic yard equalling one ton) of, say, 26,361,076,000 tons. Deduct one-half for waste in mining, preparing, and faults, and we have a net result of 13,180,538,000 tons. The amount mined from 1820 to 1870, the first fifty years of the anthracite coal trade, was 206,666,325 tons; so that we have yet in store 12,973,878,675 tons.

The progress of our coal trade is thus shown:

	Tons.
In 1820 the production was	365
From 1820 to 1830	533,194
" 1830 to 1840	5,406,711
" 1840 to 1850	15,952,893
" 1850 to 1860	42,088,644
" 1860 to 1870	50,337,354

To estimate the future consumption, we must also consider the increase of our population.

In 1830 our population was nearly thirteen millions (12,866,020), the consumption of anthracite being at the rate of one ton to twenty-four persons.

In 1840 the population was 17,069,453, and the consumption one ton to three persons.

In 1850 our population was over twenty-three millions (23,191,876), and the consumption not quite one ton per capita.

In 1860 the population was over thirty-one and a half millions (31,641,977), and the consumption about two tons per capita.

And in 1870 the population was thirty-eight and a half millions—38,555,983—while the consumption of anthracite coal had reached a ratio of three tons to each individual.

The consumption during the last decade hardly equals our expectation. From 1840 to 1850, it increased 15,952,893 tons, or at the rate of one and three-tenth millions per annum. From 1850 to 1860, the increase was 42,088,644, or three and five-tenths millions per annum. From 1860 to 1870, the increase was 50,337,354, or four and two-tenths millions per annum.

At the rate of 15,000,000 tons per annum, our supply of anthracite coal alone will last 2,600 years; the English at its present rate of consumption—say 100,000,000 tons a year—will be exhausted in 130 years. Their area has 5,419 square miles; about one-fortieth of ours.

We have hitherto been chiefly considering the anthracite coal. We must now turn our attention to the vast expanse of our bituminous fields, of which Prof. Rogers estimates that the United States contains not less than 196,850 square miles, or about nine tenths of the known coal area of the world. One of these coal fields extends from north-eastern Pennsylvania to Tuscaloosa, Alabama, a distance of 875 miles, with a maximum breadth of 170 miles; making an area of 55,500 square miles. "Comparisons are odious," oftentimes; but we cannot resist the temptation to make another just here:

	sq. m.
The coal fields of the British Provinces contain.	7,530
Those of Great Britain—England, Scotland, Wales and Ireland	6,400
The Continent of Europe	3,564
And the United States	196,939
Total	213,433

The British coal area equals 5,419 square miles; their production of coal has doubled in the last twenty years, and is now increasing at the rate of 2,750,000 tons per annum; while their estimates of its duration run from 172 years upward. With the exhaustion of their coals they sink deeper their shafts; and these, with their labor troubles, and the great emigration to our shores, which renders competition less keen among the workmen—all tend to make coal mining in England more expensive, year by year. In view of these facts we anticipate an encouraging future for our coal trade, even at this hour of its depression. We can almost realize the time when we shall export coal for the world's supply; when the vessels of all nations shall throng our wharves; when we shall not compete with pauper labor; when our home consumption of coal for the manufacture of iron shall assume gigantic proportions.

For why should we not manufacture as cheaply and as well as any other nation on the globe? We have more abundant resources than any; and all that is lacking is their development. The total product of our anthracite and bituminous mines now is but one-fifth that of England; her export alone for one year being nearly equal to our entire production of anthracite for the same year. For centuries the British Isles have been the great storehouse for the world's supply of coal, iron, and other minerals. Their coal mined in 1870 exceeded 110,000,000 tons, while our whole production of both anthracite and bituminous was but 25,000,000. Their production of iron ore was 14,000,000 tons, and of pig iron nearly 6,000,000, while our production of pig iron was less than 2,000,000. We used in 1870, a little more than 1,000,000 tons of railroad iron. We manufactured 620,000 tons, and imported 470,000 from England. Our total importations for 1870 amounted to $43,000,000. But while we are constantly growing stronger, England is as steadily growing weaker, and the contest for the manufacturing supremacy must soon terminate in our favor. Since the wages of the British miner have been increased and his hours of labor reduced to fair rates, the production of the English mines has decreased while its cost has increased; beside, the future development of their coals will be more expensive, as they are obliged to sink deeper for them. Their product will now diminish, while ours will increase. The one item of cheap labor has long retarded the full development of our resources; now the tide has turned, and our nation is going forward with rapid strides. Our ships crowd every port, our canals reach every valley, and our railways are as numerous as turnpike roads. Already we have one iron link fastened at either end on the Atlantic and Pacific coasts and two others well under way, striding through the wilderness, bearing light and civilization to the now shadowy lands.

What thoughtful man will not make the contrast, when he considers our vast resources of bituminous coal, so widely spread; our anthracite so concentrated in one State, near the seaboard; the iron ores of Lake Champlain on the one hand, those of Lake Superior and Missouri on the other, and the hematite and fossiliferous ores of Pennsylvania and the Franklinite of New Jersey, close at home—all gravitating toward a common center, where lies a coal to fuse them. Considering these, and with them our limestone valleys, our forests of timber, the oil districts of Western Pennsylvania, and our railroad and canal systems—it needs no prophetic vision to mark the spot where the workshops of the world will be. Shall we place them far North, far South, far West—or at a point of ready access to our great seaboard cities; easily reached by both rail and canal; on the great route of travel from

the Pacific coast—the route over which come alike the gold and silver of the far West, and the teas and silks of the far East? We venture the prediction that we do not stand to-day 100 miles from the spot where the London and Liverpool of this continent will be. A giant power, uninfluenced by political parties, will place them where the elements which shall constitute their greatness are readily found and cheaply gathered for manufacture and distribution.

To build up our future metropolis we must have good and plentiful materials and cheap transportation. We must exact good work, and to secure it must pay good wages, and not oppress the workmen with exhausting servitude. Neither must he dictate what his wages shall be; for his labor he must receive a just recompense, and no more.—*Iron Age.*

A Patent Pipe.

Mr. Robert Spear of Boston has made the invaluable discovery that by narrowing a pipe at certain intervals the friction which is usually developed in blowing air through a tube is entirely obviated. If, in a pipe of twelve inches diameter we make at intervals necks of ten inches in diameter, we have an annular space one inch deep around the inner circumference of the pipe. Mr. Spear's theory is that the air contained in this space does not move, but remains at rest, and thus presents an air surface to the moving mass of air ten inches in diameter which flows through the necks. As the friction of air on air is less than that of air on iron, he expects to convey power in the shape of compressed air with almost no loss from friction.

The marvel is endorsed by William A Goodwin, "city engineer of Portland, and for some years government lighthouse engineer," who describes its principles as follows:

"Given to transmit the full effect of an air compressor—not of the prime motor—be the same more or less at a pressure of say 40 lbs. to the inch The first step is to determine the size of the conduit pipe. Set a pressure gauge on the reservoir which receives the compressed air, and when a pressure of 40 lbs. is indicated, open an orifice in the reservoir so large as to exhaust the effect of the compressor as fast as delivered. The compressor is now working into the reservoir, the orifice is now blowing off, and the gauge stands at 40. Suppose the orifice to be one inch in diameter. Now attach to the same a pipe of one inch in calibre, say 100 feet long. At a point near the outer end of this pipe set a pressure gauge, and the pressure with the pipe wide open, will be found to be something less than 40 lbs. The element of friction has been developed in the pipe, and will accumulate rapidly as the distance is increased, and it is evident that a pipe of the diameter of the original exhaustive orifice will not convey the force without loss. Take a new pipe $1\frac{1}{4}$ inches in diameter; on this find the point where a slight diminution of pressure is indicated by the gauge. Just beyond this point insert a ring of one inch orifice in the pipe, giving a shoulder, all around, of $\frac{1}{3}$ inch, and the lost pressure will be found to have been restored.

"The effect of the ring or diaphragm is to line the pipe with a hollow cylinder of air throughout, which cannot advance, being prevented by the ring and held against the pipe with a pressure of 40 lbs. to the inch, and all the friction which occurs is, consequently, that of air against air. There are now at a considerable distance from the reservoir, an orifice of one inch, and there being no more than these at the reservoir itself, no force has been lost in the transmission. The reservoir has been virtually moved forward to this point. Repeating the operation at the same distance out from this point as from this to the reservoir produces the same result. Each joint or section of the pipe charges the succeeding with original force, and it would seem that there can be no limit to the application of the principle."

The marvel of all this is, that the inventor claims, that to move a given quantity of air with a given pressure, any size of his patent pipe would do the work of a much larger size of ordinary pipe; not perceiving that he has diminished even the nominal diameter of his own. To say that one inch pipe with $\frac{3}{4}$ inch necks, will deliver as much air as an $1\frac{1}{4}$ inch pipe, *not* patented, is simply saying that a $\frac{3}{4}$ inch pipe will do the work of an $1\frac{3}{4}$ inch pipe.

It is true that the pressure in the Spear pipe must be more uniform than in the other pipes. He obtains this advantage by presenting not less but *more* friction to the advancing air. At given distances he contracts his pipe so much, that to force a constant quantity of air through the narrow orifice, the pressure has to increase until it equals that at the compressor. This he puts down as a proof that he has *saved power?* Had he put a cap on the end of his tube the result would have been the same; that is the pressure would have been equal throughout the closed tube. But in this case he would have economized no power, because the flow of the air would be entirely shut off. The difference between this case of a closed tube and that of the Spear tube, which is a partly closed one, is that in one case the power is entirely shut off, and in the other partially so. In the one case the loss of power is complete, in the other it depends upon the degree to which the power has been shut off.

There certainly is nothing new in the fact that pressure can be maintained at a particular point by partly closing up the tube. Other engineers than Mr. Goodwin have, however, been in the habit of considering that greater pressure is obtained by sacrificing to a certain degree the rapidity of flow, or increasing the motive power. The main invention of Mr. Spear, is, in fact, just as novel and just as important as another "discovery" of his which the Boston *Advertiser* describes—and without blushing—in the following words:

"Mr. Spear has also discovered that while any angle or bend in any ordinary pipe obstructs a fluid flowing through, by enlarging the pipe at angles, the friction and loss of power is overcome." This discovery is just as wonderful as it is new: and no more so.

[NOTE.—If Mr. Spear wants to see an instance in which the old principle involved in the contraction of pipes has been put in use, and ingeniously so, we refer him to the new blowpipe reservoir described in our Engineering and Mechanical Notes last week. In this the flow of air is diminished and the pressure increased, so that a constant blast is obtained, and solely by the use of contracted orifices.—ED.]—*Engineer and Mining Journal.*

Progress of the Anthracite Coal Trade in Pennsylvania.

Mr. P. W. Sheafer, of Pottsville, has furnished the following statistical information of historical and commercial interest.

1768 Anthracite coal first used in Wyoming Valley by Obadiah Gore. (blacksmith.)

1775 and 1776 Several boat loads of anthracite coal were sent from Wyoming down the Susquehanna and thence hauled to the Carlisle Barracks to manufacture arms.

1790 Coal first known in Schuylkill County.

1794 Blacksmiths used it in Schuylkill County.

1808 Used in grates by Judge Fell, of Wilkesbarre.

1812 Col. Geo. Shoemaker hauled nine wagon loads of coal from Pottsville to Philadelphia and gave away the coal.

1814 Chas. Miner sent an ark load, 24 tons of coal, from Mauch Chunk, via the Lehigh and Delaware, to Philadelphia.

1815 Schuylkill navigation commenced.

1820 365 tons of coal shipped by the Lehigh Canal.

The Schuylkill trade opened in 1822, and that of the Wyoming region, now by far the largest, in 1829.

The following statement of the areas of the several coal fields is of importance, viz.:

	Sq. m.	Acres.
Schuylkill Coal-field (Southern)	146	93,440
Second or Middle Coal-field	126	80,640
Third or Northern Coal-field	198	126,720
Total area of the Anthracite Coal-fields	470	300,800

The total production of anthracite from 1820 to 1870—fifty years—is estimated at 206,668,325 tons; while, as a comparison and an indication of what may be reasonably be expected in the not distant future, from the growth of our industries, the production of Great Britain for one year, 1870, is placed beside it at the colossal figure of 110,431,192 tons.

Perhaps the most interesting portion of Mr. Sheafer's report, though it is purely speculative in character, is that in which he estimates the contents of the various fields and the probable amount of coal still remaining to be mined:

	Tons.
Taking the average thickness of the Southern field at 75 feet, and that of the Middle and Northern fields at 45 feet, he estimates the total contents of the anthracite region	26,361,076,000
Or the practical contents (deducting 50 per cent. for waste)	13,180,508,000
Already mined out 206,666,325 tons, doubled for waste	413,332,650
Balance to be mined	12,768,175,350

Taking Mr. Sheafer's estimate of the probable supply still on hand to approximate tolerably to the truth, our anthracite fields would, at our present rate of production, be entirely exhausted in about 850 years, while at the rate of production attained by Great Britain the period would be shortened to about 110 years.—*Jour. Franklin Inst.*

Coal Cutting Machinery.

At the recent meeting of the English Mechanical Engineers, at Liverpool, a visit was made by a section of the party to the Platt-Lane Colliery, to witness the operation of the coal-cutting machinery of Mr. Winstanley, a notice of which appeared in the preceding number of the "Journal."

From a more detailed description of its construction and operation which appears in a contemporary,* we condense the following information:

One of the machines has been at work for two years in a seam of coal 2 ft. 4 in. in thickness, which is notoriously hard, so much so that at one time it stood unworked, from the unwillingness of the miners to work it. The cutter is driven by compressed air, which is conveyed down the shaft and along the main roads to iron pipes, and to the machine in India rubber hose pipes, 2 in in diameter. The coal is cut by a spur-wheel, fitted with teeth, this wheel being 3 ft. 6 in. in diameter. No previous "holing" is required in its operation. The machine is drawn along the face of the coal as it cuts its way, throwing out the slack between the tram rails upon which the machine runs.

The chief advantages claimed for it are:

1st. The "swivel movement," by which means the cutter holes its own way into the coal, cutting from nothing up to 3 feet; and for bringing the cutter back underneath the framework of the machine when not at work, thus allowing its transportation through narrow ways without removing the wheel.

2d. Applying the power to drive the cutting-wheel directly on the periphery of the wheel, and the allowing of the waste to fall through to the bottom without clogging the teeth of the machine.

The average rate of "holing" by the machine is from 25 to 30 yards per hour, according to the quality of the material, and it had frequently cut the whole length of the face of 120 yards in a night. As in this mine 5 yards per day is considered above the average of the work of a miner with the pick, the work of the machine may be estimated as equal to that of 40 men. The machine works at night, the coal being removed by day by manual labor. It is, moreover, asserted that this particular seam could not be worked save by the machine; or, if men could be obtained for it, the proportion of coal to slack would be 3 to 1, while with the machine it is 8 to 1.

The actual cost of getting out the coal by machine and by hand labor has been found, by the payments made during a period of six weeks at the Platt-lane colliery, to be as follows: Hand labor, 3s. 6½d. per

*The *Engineer*, xxxiv, 99.

ton; machine labor, 3s. 1½d.; showing a saving of 5d per ton by the latter.

The statistical account above given would not be complete without the statement that the machine in question, at the time of the visit of the society, had been in operation for six months with little or no repair.

Finally, in view of the fact that the expediency of introducing coal-cutting machinery is a question of annually increasing importance, the above details acquire considerable weight, since they are the first reliable and well-digested facts collected upon the subject, and extending over a considerable space of time. —*Journal of Franklin Institute.*

The Generation of Petroleum.

[We find ourselves obliged to say that we give place to the following, copied from a contemporary, merely as an illustration of those tissues of nonsense which are so frequently woven by writers who attempt to go beyond the limited sphere of their knowledge (in this case *very* limited, evidently), a kind of writing disgracefully rife in America.—Ed.]

The recent development of the reproductive power of petroleum wells that had been for some years abandoned because they were believed to be exhausted (says the *Petroleum Monthly*) is not alone a matter of value to the owners of the territory that was untilately presumed to be incapable of further production but it affords a more trustworthy basis than any the world has heretofore been able to obtain for forming an approximately correct opinion concerning the chemical process whereby petroleum is generated. Until within a few days, a popular opinion prevailed that petroleum, in spite of its name, was the product of coal; and so nearly was this idea general among a majority of people, that many receivers of petroleum are still accustomed to order it as "coal oil." The belief, however, that the terene oil of Pennsylvania and Canada is exclusively a product of bituminous coal may now safely be pronounced to be an error. There is certainly no evidence that coal is not one of the substances from which petroleum is distilled; but at the same time, it is a somewhat strange fact, allowing a proper degree of credit to the belief that coal does enter into the composition of petroleum, that no coal-beds susceptible of being worked are known to exist within fifty miles of the oil-producing territory. Again, it is a manifest and recognized fact that carbon does predominate as an integral essence of petroleum; and the other fact that the oil territory of Pennsylvania is surrounded by beds of bituminous coal renders it eminently reasonable to believe that coal enters largely—if not, indeed, more largely than any other substance—into the process of distillation whereby petroleum is produced. Petroleum is certainly a mineral oil. But whatever may be the number and chemical variety of the minerals from which it is formed, the distillation of it is more intimately associated with limestone than with any other mineral. Sandstone is also found in boring oil wells, but it is from the pores of limestone that, in the chemical process of extracting oil from the minerals found in connection with its production, the greatest quantity of petroleum is taken.

It is singular that, in boring for oil, no coal has ever been found, even in the smallest quantities, while sand, sandstone, and limestone abound. The inference, therefore, cannot be escaped that petroleum is the product of the distillation of at least two, and probably of more than three, distinct mineral properties. In the process of manufacturing refined oil, the crude article yields three different products—naphtha, kerosene, and residuum—a fact which certainly supports the belief that crude oil is the product of three different minerals. So far as concerns the contribution by coal of an integer in the chemical process by which petroleum is produced in and from certain geological strata, it may be remarked that the "shale" oil produced from bituminous coal in England is very different from American petroleum, in that the American naphtha must be used in order that the latter may be burned in lamps. Another fact that favors the inference that petroleum is mainly produced from or generated through limestone, is that petroleum has been extracted from limestone found in the neighborhoods of Chicago and of Terre Haute, Ind. In regard to the reproductive powers recently developed in the Pennsylvania territory, believed to have been exhausted, it affords two favorable presumptions—first, as a partial assurance that the distillation of petroleum is a continuous process; and next, that the formerly abandoned territory was given up because the machinery for extracting petroleum from the earth, exceeded in its power of exhausting the fluid, the generative powers by which it is produced.

Are We Prepared for a Great Fire.

In one sense, we are exceedingly well prepared for a great fire. That is to say, we have on hand a large supply of inflammable material, skillfully collected in some of the most crowded quarters of the city, and admirably calculated to produce, at a very short notice, the biggest fire we have had since Dec 16, 1835. There are the oil men for example. They are gregarious in their habits; the business, like most other leading branches of our commerce, is centralized, and, within a comparatively narrow area, there is stored enough of grease and lard and oils, explosive and non-explosive, to feed a central furnace of flame, which would only need the aid of a high wind to lick up half the city. A fire once fairly started in the Maiden-lane and Water-street region would defy the puny efforts of a fire-brigade working with Croton at half-pressure, and incapable of taking up any line in advance of the spreading crescent of flame, through which such a conflagration would not find loop-holes of escape. We are gravely assured that the oil-region of the city has been remarkably fortunate in escaping the visitation of a great fire. So was the business section of Boston, but when the fatal day came people wondered there, as they would wonder here, that they had escaped so long, considering the many avenues they had prepared for the triumphant passage of the destroyer.

Then there are the soap factories and the distilleries. These are, for the most part, to be found closely environed by tenement houses, and with a populous locality, stretching for a long distance on either side of them. The oil men can, at least, plead that their warehouses are situated in a part of the city comparatively deserted after nightfall. The people who make fortunes out of boiled grease and distilled spirits might come down to their business in the morning to find, not only that their factories had been burned out, but with them a few hundred poor families, enough of whose members would be suffocated or roasted in bed to make what the reporters would call a "frightful holocaust to the fire demon." This would make a nine days' wonder which would run through its three three phases of popular indignation, official investigation, and promiscous censure of nobody in particular. It might even arouse people to the necessity of some kind of action with a view of isolating the soap boilers, the lard refiners, or the distillers of alcohol, so as to prevent their factories becoming the centre for a wide circle of ruin. It might also be the means of causing the enforcement of some stringent regulations against the careless use of pipes or matches or candles in such places. But is it necessary to pay such a price for a little wisdom when the lesson is already before us in striking enough characters? The proverb about an ounce of prevention has a very serious significance here.

With such magazines of flame dotted all over the centre of the city, there is an inflammable belt of lumber yards on both sides of it. Here the casual laborer, in his hours of leisure, smokes unchallenged the meditative pipe, and here as the red ashes are blown or shaken away might originate a fire as inscrutable in its origin and only less terrible in its consequences than that which, for want of a better explanation, was tacked on to the tail of Mrs. O'Leary's cow. The fact is, New York has never been subjected to the stern and salutary ordinances that ought to regulate the growth of a great city. Like the framework of its Government, it has expanded without system, and become metropolitan in importance before it had outgrown the methods of a somewhat populous town. The city has never yet been ruled by men having sufficient grasp of great principles to make it worthy of its existing position or to anticipate its future needs. We trust to see all that changed by and by, and the attention of an administration which should be equally able and upright, which should be as much distinguished for prescience as for firmness, ought to be at once directed first to the means of preventing, and then to the mode of arresting the progress of a great fire.—*N. Y. Times.*

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FEBRUARY 17, 1873.

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Flame-Organ.

An Ipswich (England) paper in an account of a meeting of a local scientific body, says: Without doubt the most ingenious contrivance was the musical flame-organ, invented and constructed by Mr. Ford Goddard. It would have done no discredit to a scientific metropolitan *concersazione*, and all who were acquainted with the theory on which it is based, and knew the difficulty there must have been in developing the invention, awarded Mr. Goddard the praise which was his due. We are afraid that in the noise and bustle the organ did not receive all the attention it deserved, its principle not being readily understood. It is now some years since it was discovered that hydrogen gas, when burnt in a tube, emitted a musical note, owing to the vibrations caused by the rapid and regular explosions of that gas with the air rushing into a tube. The same results have been obtained by Mr. Barratt—and these were exhibited at the Royal Institution—with ordinary coal gas. This fact has been made use of in the gas-flame organ exhibited on Tuesday evening, in which a series of jets, numbering twenty, burning in tubes of different lengths and proportionate sizes, were made to produce a chromatic scale of notes. Each tube was capped with a valve which was opened by means of a connecting-rod attached to a digitorium, and thus beautiful chords could be struck, and simple melodies played at the will of the performer. Owing to the tubes being constructed of glass, the action of the flame could be seen. Mr. Goddard played 'Home,

[*For continuation see page* 64.]

THE AMERICAN

GAS-LIGHT JOURNAL

AND

Chemical Repertory,

PUBLISHED ON THE 2D AND 16TH OF EACH MONTH,

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MONDAY, FEBRUARY 17, 1873.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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NAPHTHALIZATION OF GAS: DAYTON'S CARBURETTER.

Dr. Wahl, of the *Journal of the Franklin Institute*, winds up an article on "Gas Machines," from which we recently took extracts, with the following opinions:

"The introduction of gas machines has greatly extended of late years, and, owing to the cheapness of the light petroleum oils, and the numerous improvements which have been made in construction, this increase bids fair to be still greater in the future. The whole subject is one of great practical interest, and it may safely be said that it has not received from the public that attention which its importance demands."

Agreeing to a great extent with these views, we still think that in the application of the Mansfield Invention of air naphthalization, even to these refuse petroleum products, the *dead loss* of candle power, or illuminant energy, arising from the great load of atmospheric nitrogen which must be carried and heated up to the temperature of the flame, will go so far to compensate for the cheapness of the naphtha as to cut down the economic advantage, in many cases at least, to a rather doubtful mark. This, however, is a question determinable by exact quantitative experiment; and the fact that we have as yet no results of such precise investigation with any of the multitude of gas machines, is an illustration of the extremely lax way in which we do so much of our work in this country, by "rule of thumb," as it is expressively phrased.

Far otherwise must it be regarding the application of Lowe's Invention, when our cheap mineral naphtha is used. The economy in cost of candle-power is here so obviously inevitable that none would entertain a doubt. Still it is far more satisfactory, both to men of science, and to all practical men who are truly entitled to the name, to have *exact figures*, on which to base reliable calculations and estimates, instead of mere conjectures. An opportunity therefore, which recently occurred to the writer, to make some accurate tests with a recently invented apparatus for this purpose, was availed of with alacrity. The inventor is Henry G. Dayton, of Maysville, Kentucky, and we have procured from him a cut of the apparatus with his specification, which we are enabled to present on the first page of the present issue. The plan seems very simple, cheap in construction, and, so far as could be observed during two days experimenting with it, efficient in accomplishing its end.

Having but a few hours to prepare for the experiments, the preparations were made in a small room in one of the hotels in Park Row, opposite the new Post Office, where some arrangements were extemporized for applying the *shadow test*. These worked very satisfactorily. The candles were standard sperm from the Am. Meter Co., and were weighed delicately on one of the writer's own balances turning with 1-50th of a grain. The service pipes we had to use were so small that but about 3½ feet of gas per hour could be got through (at the day pressures) the Argand burner used. A series of careful tests of the gas alone (gas of the New York Gas-Light Co.) at about this flow, all corrections applied, gave the somewhat surprising average of 17·55 candles for five feet. This we cannot now stop to comment on. When the naphthalizer was now interposed, the flow ran down to 2·4 feet. This was possibly due in part to increased resistance, but doubtless still more to the *higher density* given to the gas by the naphtha-vapor, which of course tends rapidly to decrease the effusion from the burner. There is, however, another small consideration bearing on the flow. This diminution from 3·25 to 2·4 of the street gas that passed through the test meter, did not represent the full volume that flowed from the burner tip, as this latter was increased by the volume of the naphtha-vapor taken up. I had no means of measuring this on the spot at the time, and it can only be calculated from the amount of vapor taken up. Naphtha, of the quality used by Mr. Dayton, of 72° Beaume, has a vapor density seven to eight times that of street gas, or about three and a quarter times that of air. One cubic foot of such vapor weighs about four ounces. According to Mr. Dayton's experiments (only approximate) three feet of gas take up one ounce of naphtha, which is at the rate of an increase of one-thirteenth the volume of the gas. Thus the 2·4 feet at the meter, correspond almost to 2·6 of the naphthalized gas at the burner tip. A series of careful observations with the shadows, in which the average was taken of the judgment of my own eye and that of another gentleman present, all the corrections being applied, gave for five feet at the test meter, with the naphthalizer, 33·6 candles; or very near to a doubling of the candle-power due to the gas.

The upshot of this appears to be, when simplified, that 500 feet of street gas, taking up one and three-quarter gallons of naphtha (weighing six lbs. to the gallon) costing say 30 cents, become equal in candle power to 1,000 feet when burned pure and simple. Here is a clear margin for economy which is certainly worth some effort to realize in practice. Mr. Dayton represents that he is in condition to bring forward copious and irrefragable evidence that he and his customers (using his apparatus with coal-gas) *do* realize this large economy, and without any of the drawbacks, dangers, or inconveniences that have been laid at the door of naphthalization.

Our space is for this time exhausted, but we trust to pursue this subject in future issues, if we succeed in obtaining further facts of a scientific or practical bearing.

LAMPBLACK FROM GAS-WELLS.

That, in order to make profitable the enormous volumes of gas given off by our American palæozoic rocks, it should be necessary to resort to the manufacture of *lampblack*, is a curious commentary on the slowness with which new ideas often spread in this much vaunted and vaunting land of ours. The fact is the American people *will not*, any more than any other people, take up new inventions spontaneously. Every invention must have its martyr at first, who devotes his life to its demonstration and propagation, and who usually "has his labor for his pains." With regard to the utilization of gas wells, though the writer made the earliest suggestions and inventions, and awakened much public attention to the subject, he has not had the least inclination to become such a protomartyr.

It appears that Mr. Howarth, of Boston, well-known in connection with coal-oil manufacture, is making lampblack successfully from *one-twelfth* of the gas from a well near Cumberland, Maryland, the other eleven-twelfths going to waste it appears. It is consoling to find that he hopes yet to save *one-fourth* of the carbon in this form. Those who heard the writer's paper on the West Bloomfield gas-well, now used for supplying Rochester (at least the newspapers say so) read to the New York Lyceum of Natural History three years ago, will remember his exhibiting in connection with it a large bottle of the lampblack collected by himself on the spot in December, 1869. This sample he still has. Its formation,

on the combustion of the gas in large volumes, with a limited supply of air, is of course inevitable, and almost always results more or less in the stoves and fire-places used for burning it.

APPROVAL AND REPROVAL.

The *Scientific American* appends a reply to a question of one of its correspondents to which we are forced to take exception, the more especially as it relates to a subject coming within the scope of this Journal. We clip as follows:

> R. and A. say:—Is it possible to bring such an intense degree of heat upon a leaden pipe, say three-quarters of an inch, that the heat would melt the pipe provided a continuous stream of water runs through the pipe? Is it possible to melt a lead pipe at all under these conditions? Answer: Yes. It is possible to melt a lead pipe under the circumstances you mention. One method of doing so would be to girdle the pipe with a platinum wire, heated to white heat by a galvanic battery. It would quickly melt the pipe through.

The idea of our neighbor is ingenious, but a little chemical knowledge would have led him, before propounding it to apply a very important and essential modification. Indeed any one who attempted to follow out strictly the prescription of our contemporary would inevitably meet with failure and botheration, as it would be the wire that would be, not only cut, but totally destroyed wherever it came into contact with the lead.

We would suggest the substitution for the platinum of a wire of *iron* or other metal that does not form highly fusible alloys of lead with so much avidity. Chemists are familiar, sometimes to their large cost, with the fact that a particle of lead getting into a hot platinem crucible or dish melts a hole through it with very calamitous celerity.

☞ We learn that the Cincinnati Gas-Light and Coke Company have contracted with Messrs. George Stacey & Co., of Cincinnati, to take down one of their old single-lift gasholders and guide-frame, and to erect in its place a new flat-top telescopic gas-holder. They have also contracted with the same firm to erect a new set of cast-iron purifiers, center seal and connections.

All the work will be done from plans and specifications furnished by William Farmer, Esq., of this city, and will be under his supervision as Engineer.

Horace Greeley and Science.

Dr. Vanderweyde gives us the following information about the illustrious departed: "He deplored the circumstances of his early life, which gave him no chance to acquire the rudiments of science. We have often heard him express deep and painful regret that there was no one to guide his childhood in the direction of studying the phenomena of Nature. He keenly felt that his life had been made less enjoyable to himself, and less valuable to the public, for want of the early cultivation of the observing powers by natural objects, as the great defect of our common education. He knew nothing of science, but he never despised it, as is too frequent with the devotees of literature and politics, who are generally ignorant of it; and he was always strong in his condemnation of our educational system, because of its culpable neglect of scientific studies. He was emphatic in insisting that the study of natural things should be commenced in childhood, so as to maintain a place in after-development; for he saw how difficult it is, when the mind becomes engrossed with other knowledge, to give proper attention to the study of science. All who are familiar with the course of the *Tribune* in its early days will remember the prominence given to science in its columns—the copious illustrated reports of the lectures of Lardner, Agassiz and others. Had it not been for the all disturbing influence of the anti-slavery convulsion, which distracted the country for twenty years, this early policy of the *Tribune* would undoubtedly have been carried out in a systematic way, and with the most salutary public results. If Mr. Greeley did not understand science, and was therefore unable to assist in its direct development, he, nevertheless, appreciated the noble part it is to play in the world's affairs, and the great service the press can render in promoting it; and, in the card announcing his return to the editorial control of the *Tribune*, he stated that this would be among the great objects to which he proposed to dedicate the remainder of his life."—*Manufacturer and Builder.*

Open Fires.

In every home there should be at least one open grate, or some other arrangement for burning wood or soft or hard coal. A fire which can be seen as well as felt—a cheerful, bright, blazing fire, with shovel and tongs—and fender, too, if you please—which will attract the family by its social influences, is a grand thing in a home.

Those black, grim, tartarean flues, filled with the stale odors of cellar and hot air-chamber and seething water-tank, and emitting clouds of pulverized ashes to cover your furniture and stifle your lungs, are among the greatest banes of family enjoyment and comfort. It is all well enough to have one's dwelling warmed from top to bottom, and to have no coals to carry beyond the furnace, but this heating system has done immense mischief to the family powers, scattering the members of it all over the house, and furnishing not one attractive spot in which the inmates will gather, as by instinct they do, to enjoy the cheery comfort of the fireside. There is no fireside in most of our modern houses. There are only holes in the floor or in the walls. And we are disposed to think that the good ventilation of the open fire adds not a little to the unconscious blessings of its hospitable and domestic influence. The sight of the little folks, as they sit musing and amused while the wood fire burns, and watching the fantastic flames and the glowing coals, is worth many times the cost of that cord of hickory or oak at city prices; and a wise household would rather part with the furnace which that bright blaze supplements and atones for, than with the low-down grate which makes the family circle a real thing. Try it, ye who can, and see if the moral, æsthetic, and domestic power of this style of home comfort is overestimated. —*The Science of Health.*

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Gas Companies, and all parties using Screening Shovels, are cautioned against the purchasing (or manufacturing) of any other than myself, or my agents, COKE SCREENING SHOVELS, made either in whole, or in part, of **Malleable Iron,** as such is decided to be an infringement of Butler's Patent of June 4, 1872.

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This process is not only safe, simple and effective, but costs little to apply. The only machinery necessary is a one and a half inch stop cock, and a half inch stop cock to each bench No alteration in the old system is required. In fact, a Works operated with this process, can at any time be operated on the old pressure system, simply by closing the two stop cocks above mentioned. There is nothing to get out of order, nothing that requires special attention; no stuffing-boxes to pack and keep tight, no valves to keep clear of tar and pitch, no levers to lubricate, and no expense for a great amount of machinery.

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Sweet Home,' and other familiar airs, and his audience were delighted with the correctness and melody of the music. By means of a long tube, the explosion of the gas bubbles which caused the musical notes was rendered visible; for, just as a lighted stick, if whirled round at a greater rate than the eighth of a second, cannot be followed by the eye in its course, but appears as a ring of light, so the rapidity with which the minute gas explosions followed each other could not be perceived by the ear, the effect being that of continuous notes.

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☞ In looking for advertisements, see figures 1 to 12, within brackets, at head of advertisement pages.

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AMERICAN

GAS SCREEN MAN'F'G COMPANY.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the Screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4te Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

LUTHER DAY, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why they will not last for a long time. The *very large amount of open space* in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yonrs,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respedtfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some, five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the best *of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3, 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.
SPRINGFIELD, MASS., Oct. 10, 1871.

MR. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable, and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them, than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU.

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience. Yours truly,
P. E. DEMILL, Secretary.

We give a list of some Gas-Light Companies using them.

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Amer. Gas Screen Man'f'g Co., Haverhill, Mass

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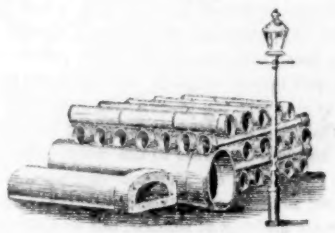

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SAMUEL DOWN, President American Meter Company, N. Y.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
CHARLES MOWTON, Engineer New York Gas-Light Company, N. Y.
SAMUEL P. PARHAM, Engineer Mutual Gas-Light Company, N. Y.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL.
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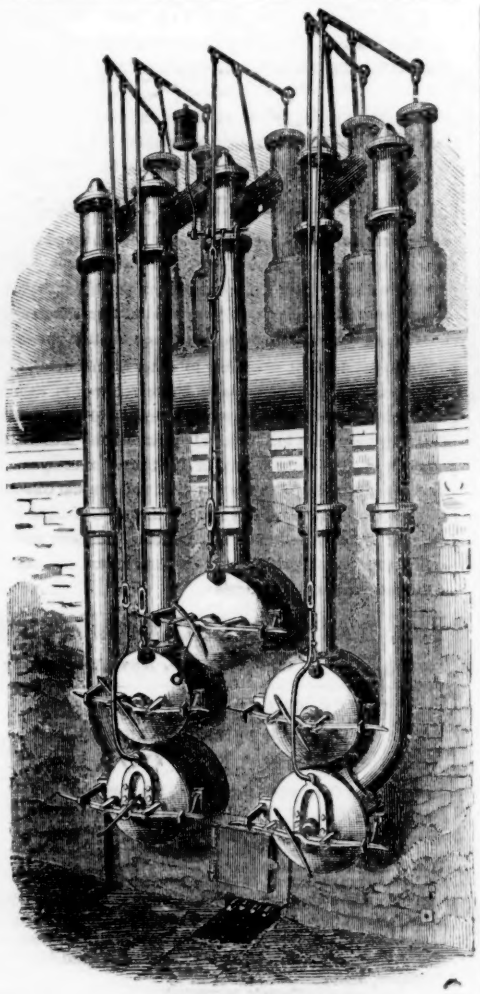
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal. [254-



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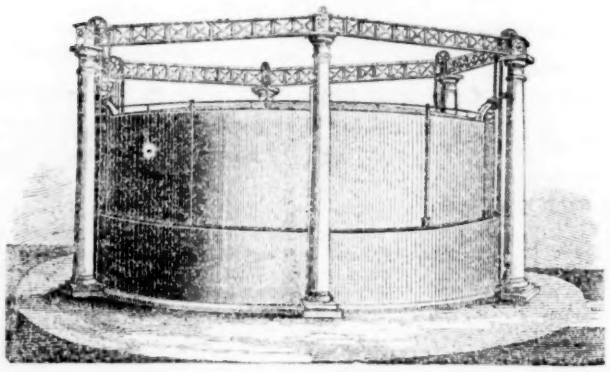

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Fire Hydrants,

GAS HOLDERS.

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E. W. McGINNIS, Secretary and Treasurer.
JOHN P. KENNEDY, Chief Engineer.
LEONARD D. GALE, Consulting Chemist.

GENTLEMEN: We beg leave to inform you, that we have purchased the Patent process for making ILLUMINATING GAS from PETROLEUM and its products, known as the

Gale and Rand Patents,

and we are now prepared to treat with you for the use of said process by your Company.

We are also prepared to contract for putting said process into successful operation in your works, furnishing all the necessary plans, materials, and workmen for that purpose.

We do not deem it necessary to enter upon a detailed description, here, of the processes above referred to, deeming it sufficient to state, to secure your interest and investigation, that they have been in successful operation, for months, in a number of Gas-Light Works in the United States, and are now being introduced in the works of the Mutual Gas-Light Company, of New York City; the Citizens' Gas-Light Company, of Brooklyn; the New Orleans, San Francisco, and very many other Gas-Light Companies throughout the country.

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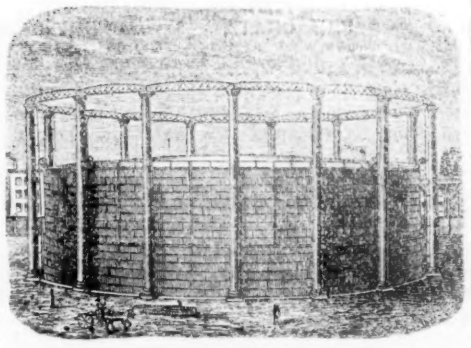

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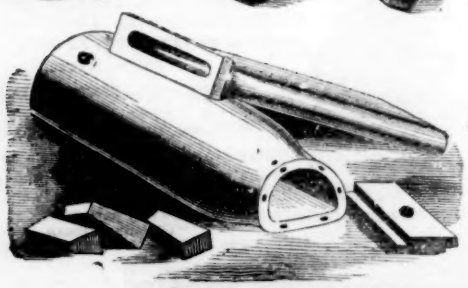

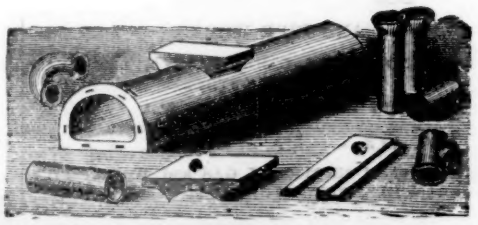

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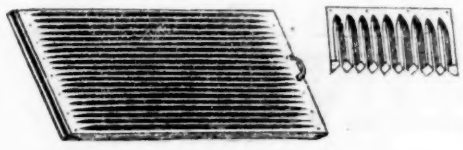

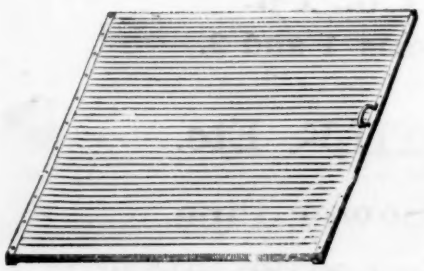

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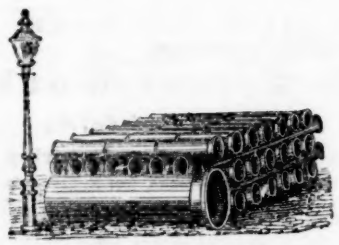

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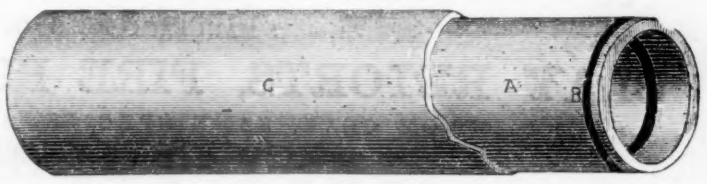

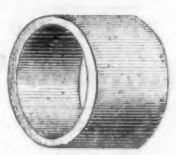

FIG. 2.

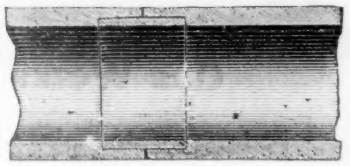

FIG. 3.

A—Cylinder of Wood. B—Band of Iron. C—Coating of Hydraulic or Asphaltum Cement.

FIG. 2.—Thimble for Connection. FIG. 3—Horizontal Section and Connection.

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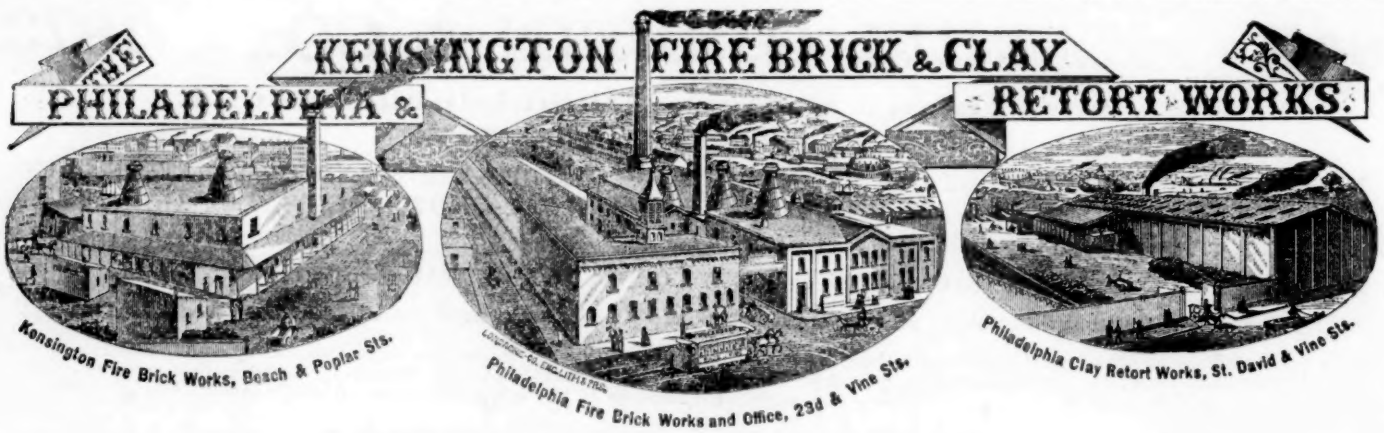
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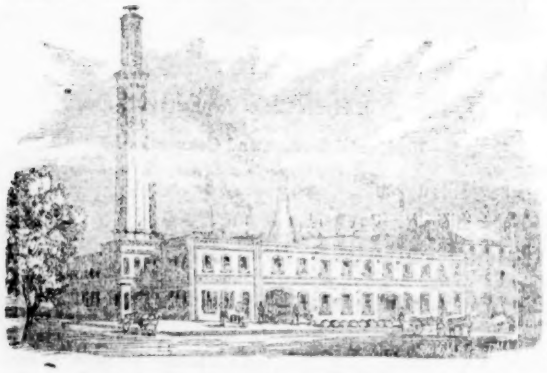

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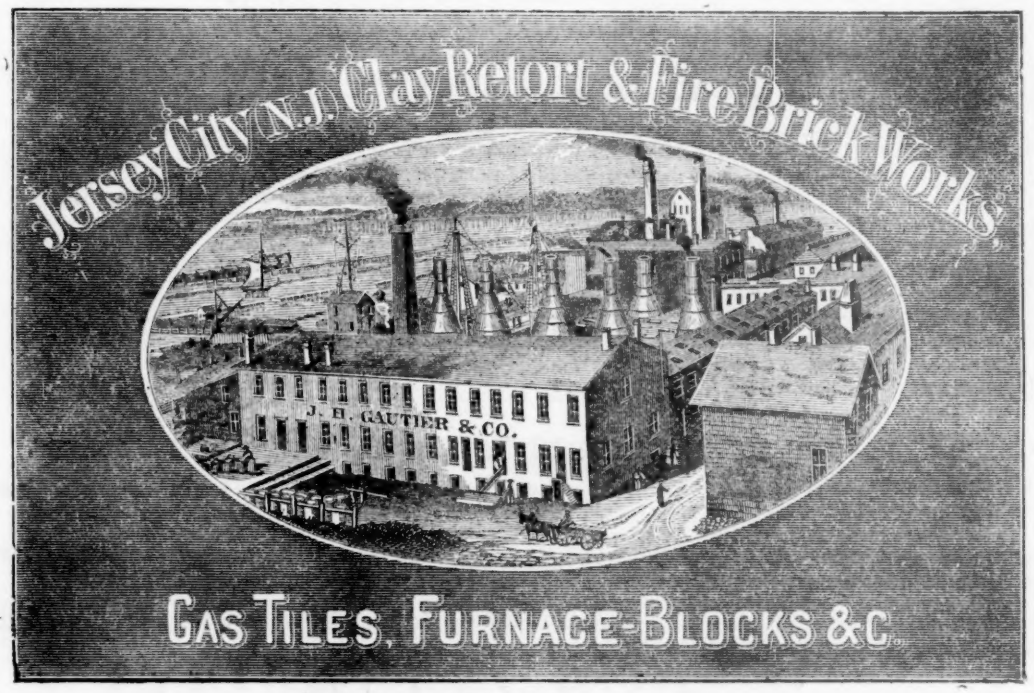
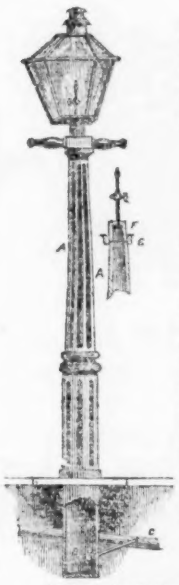


GRAHAM'S

Patent Anti-Freezing

LAMP POST.



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WOOSTER, OHIO
Jan. 24, 1871.

J. W. GRAHAM,

Dear Sir: Yours of the 14th inst at hand. In reply I would say that we have tested the six anti-freezing Lamp Posts purchased from you, and find them to be all as you represented. Whilst nearly a dozen of our sixty-five Posts were frozen down last month and first of this not one of yours was affected by the heavy frost. What can you sell them at?

Yours truly,
LUCAS FLATTERY
Sec'y Wooster Gas-Light Co.

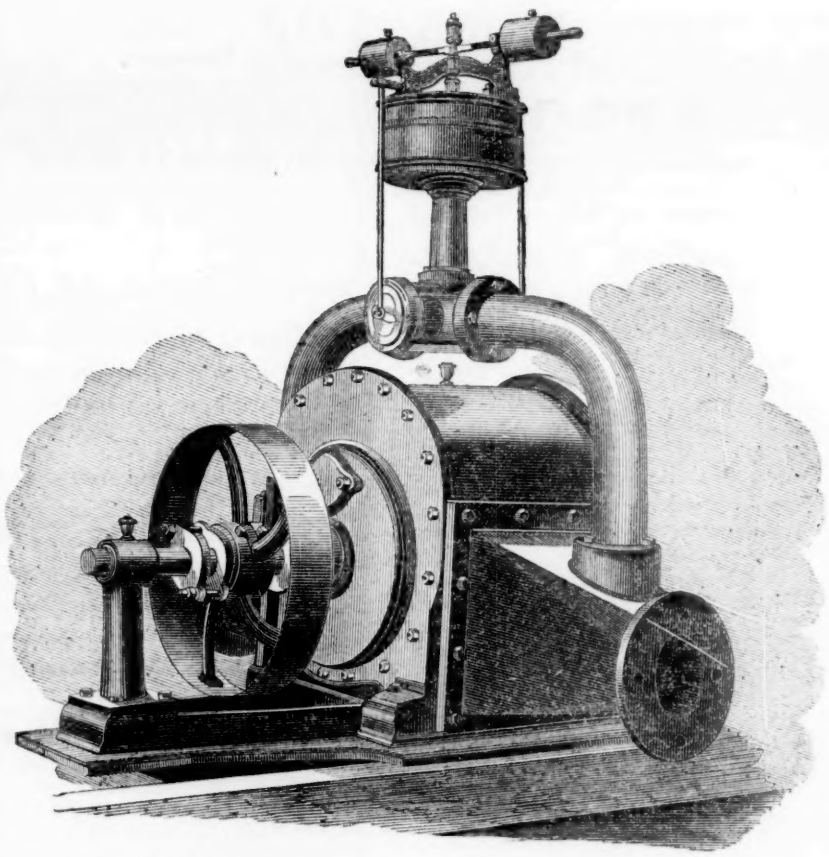
Address the Patentee,
J. W. GRAHAM,
Chillicothe, Ohio.

250-9t

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



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We are also sole proprietors and manufacturers of the

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The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

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REFERENCE.—RICHARD MERRIFIELD, ESQ., late Vice President MANHATTAN GAS-LIGHT COMPANY.

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SCRUBBERS.—Single or Multitubular Scrubbers, with Self-Acting Pumps for Ammonia Water.

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GAS HOLDERS.—Single Lift and Telescopic Gasholders, with Cast or Wrought Iron Suspension Frames.

GAS GOVERNORS.—Station Governors, with Regulating and Indicating Columns for Inlet and Outlet Pipes, also Dry Governors with Flexible Diaphragms for Underground Pipes.

STOP VALVES.—Double Faced Stop Valves for Gas or Water, from three inches to forty-eight inches diameter. These Valves are proved on both sides, with a heavy Water Pressure, Flange and Bell Pipes, Fittings and Drips of all descriptions. Steam Boilers and Hot Water Apparatus for Heating Building, and Gas Holder Tanks. Lamp Posts and Lanterns.

P. Munzinger's Improved Centre Valve Improvement.

PATENTED JUNE 6TH, 1871.

Fig. 1 represents a Dry Centre Valve complete for four Purifiers. It is also arranged so as it can be used for one, two, or three Purifiers.

Fig. 2 represents a section through.

The construction of the Valve is such that one Purifier is always shut off for cleaning or repairing.

The claim in this improvement is the concentric inlet and outlet, drip pipes, rotary valve, and the covered radial joints.

The joints being covered prevent the tar and ammoniacal liquor, dropped by the gas, from rusting the joints, which happens in all other Valves where the joints are not covered, thereby making a leaky Valve.

This Valve has been in use for three years, with perfect satisfaction.

Fig. 1.

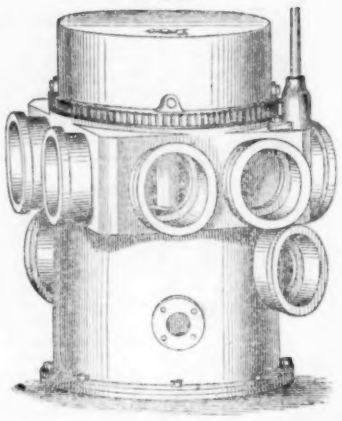
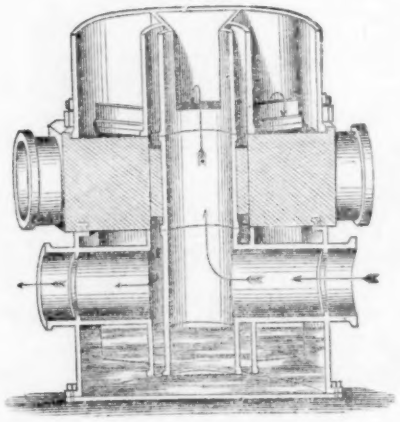


Fig. 2.



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Lowell Gas-Light Company, Mass., 20 inches.
Hartford City Gas-Light Company, Conn., 16 in.
Nashville Gas-Light Company, Tenn., 16 in.
Utica Gas-Light Comwany, N. Y., 12 in.
Lynn Gas-Light Company, Mass., 12 in.
Lewiston Gas-Light Company, Maine, 12 in.
Albany Gas-Light Company, N. Y., 12 in.
Salem Gas-Light Company, Mass., 12 in.
Columbus Gas-Light Company, Ohio, 12 in.
Trenton Gas-Light Company, N. J., 12 in.
New Britain Gas-Light Company, Conn. 10 in.
Westchester Gas-Light Company, N. Y., 40 in.
St. Paul Gas-Light Company, Minn., 10 in.
Schenectady Gas-Light Company, N. Y., 10 in.
Rahway Gas-Light Company, N. J., 8 in.
Atlanta Gas-Light Company, Georgia, 8 in.
Altoona Gas-Light Company, Pa., 8 in.
Harrisburg Gas-Light Company. Pa., 8 in. and 6 in.
East Newark Gas-Light Company, N. J., 6 in.
Cumberland Gas-Light Company, Mo,, 8 in.
Augusta Gas-Light Company, Ga., 6 in.
Princeton Gas-Light Company, N. J., 6 in.
Lockhaven Gas-Light Company, Pa., 6 in.
Hagerstown Gas-Light Company, Md., 6 in.
Coatesville Gas-Light Company, Pa., 6 in.
Uniontown Gas-Light Company, Pa., 6 in.
Wooster Gas-Light Company, Ohio, 6 in.
Pontiac Gas-Light Company, Mich., 6 in.
Battle Creek Gas-Light Company, Mich., 6 in.
Lawrence Gas-Light Company, Kansas, 6 in.
Indiana Gas-Light Company, Pa., 8 in.
Washington Gas-Light Company, Pa., 6 in.
Medina Gas-Light Company, N. Y., 6 in.
And many other Gas Companies.